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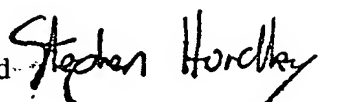
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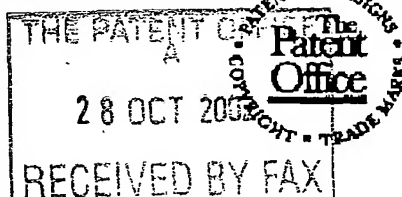
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28OCT02 E7588451 D00223
 P01/7700 0.00-0224957.1

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(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

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Cardiff Road
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1. Your reference

P-UK-CS1145

2. Patent application number
 (The Patent Office will fill in this part)

0224957.1

28 OCT 2002

3. Full name, address and postcode of the or of each applicant (*underline all surnames*)

BLACK & DECKER INC
 DRUMMOND PLAZA OFFICE PARK
 1423 KIRKWOOD HIGHWAY
 NEWARK, DELAWARE USA

Patents ADP number (*if you know it*)

341 214004

If the applicant is a corporate body, give the country/state of its incorporation

DELAWARE, USA

4. Title of the invention

HANDLE ASSEMBLY FOR TOOL

5. Name of your agent (*if you have one*)

SHAYA, D M; BELL, I S; CAVALIER, M A M;

"Address for service" in the United Kingdom to which all correspondence should be sent (*including the postcode*)

BLACK & DECKER
 PATENT DEPARTMENT
 210 BATH ROAD
 SLOUGH
 BERKS SL1 3YD
 United Kingdom

Patents ADP number (*if you know it*)

8130148001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (*if you know it*) the or each application number

Country

Priority application number
 (*if you know it*)

Date of filing
 (day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
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8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (*Answer 'Yes' if:*

YES

- a) any applicant named in part 3 is not an inventor, or
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Priority documents

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Statement of inventorship and right to grant of a patent (Patents Form 7/77) YES //

Request for preliminary examination and search (Patents Form 9/77) YES

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11. I/We request the grant of a patent on the basis of this application

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D.M. 81

Date: 28 October 2002

12. Name and daytime telephone number of person to contact in the United Kingdom D M SHAYA 01753 500804

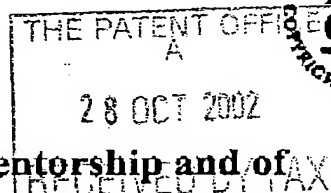
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Statement of inventorship and of
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The Patent Office

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1. Your reference

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0224957.1

28 OCT 2002

3. Full name of the or of each applicant

BLACK & DECKER INC

4. Title of the invention

HANDLE ASSEMBLY FOR TOOL

5. State how the applicant(s) derived the right
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Date: 28 October 2002

D. M. S.

8. Name and daytime telephone number of
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DARRIN SHAYA

01753 500804

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Enter the full names, addresses and postcodes of the inventors in the boxes and underline the surnames

ANDREW WALKER
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6931992001

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Reminder

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DUPLICATE

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HANDLE ASSEMBLY FOR TOOL

The present invention relates to handle assemblies for tools, and relates particularly, but not exclusively, to handle assemblies having combined friction gripping and vibration damping properties, for power tools in which an output shaft is driven by a motor.

Known power tools, such as power drills in which a drill bit is rotated by an output shaft which is in turn rotated by means of an electric motor, generate significant amounts of vibration, which can under certain circumstances limit the length of time during which the tool can be used continuously, and may even cause injury to users of the tool. In addition, the housing of such tools is generally made from a durable plastics material on which it can be difficult for a user of the tool to maintain a grip when the tool is in use for a sustained period.

US 6308378 discloses a gripping arrangement for a handle of a power tool in which the sides of the handle are provided with frictional gripping zones, each side of the handle including a plurality of alternating gripping zones of a softer material and a harder material. The softer material used is generally a thermoplastic elastomer or rubber material, and the harder material is generally the same material as that from which the tool housing is formed.

This known arrangement suffers from the drawback that because the softer material performs the dual functions of providing a friction grip and vibration damping, the choice of material constitutes a compromise in that although it will have acceptable friction reducing and vibration damping properties, the performance of the handle is limited because a material having optimum frictional properties will generally have unacceptable vibration damping properties, and vice versa.

WO02/38341 discloses a grip handle for a hand-held machine tool in which a hand grip is separated from the remainder of the housing by a vibration damping element

P-UK-C51145

consisting of an inflatable annular air filled cushion. An additional handle is provided which has a tubular grip element surrounding a further annular air cushion.

5 This known arrangement suffers from the drawback that the vibration damping properties of air can only be varied by adjusting the air pressure within a chamber containing the air, and even then, the range of vibration damping properties achievable is limited. Furthermore, it is difficult, and therefore expensive, to manufacture a sealed chamber containing air having a predetermined pressure.

10 Preferred embodiments of the present invention seek to overcome the above disadvantages of the prior art.

According to an aspect of the present invention, there is provided a handle assembly for a power tool comprising a housing defining a handle and housing a motor for
15 actuating an output member of the tool, the assembly comprising at least one flexible member adapted to be mounted to a surface of the handle of the power tool and having an engaging portion adapted to be engaged by a hand of a user of the tool, and at least one chamber containing at least one vibration damping gel material located in use between the engaging portion and the surface of the handle.

20

By providing at least one flexible member and at least one chamber containing at least one vibration damping gel material between the engaging portion and the surface of the handle in use, this provides the advantage of enabling the material of the flexible member to be chosen to have the optimum frictional properties to enable a user to
25 maintain a grip on the tool, and the vibration damping gel material at the same time to have the optimum vibration damping properties. In particular, it is possible to provide gel materials having a wide range of vibration damping properties compared with air.

At least one said chamber may be formed in a respective blister pack.

30

By defining at least one said chamber by one or more blister packs, this provides the advantage of simplifying construction of the assembly, which in turn reduces the cost of manufacture of the assembly.

- 5 At least one said blister pack may include at least one said flexible member.

By using at least one said flexible member to form part of a corresponding blister pack, this provides the advantage of further reducing the cost of manufacture of the assembly by providing one or more components which perform more than one
10 function.

At least one said blister pack may comprise respective first and second flexible sheets defining at least one said chamber therebetween, wherein said first and second sheets of the or each said blister pack are sealed to each other at the periphery of the or each
15 said chamber.

At least one said blister pack may be foldable.

This provides the advantage of enabling the blister pack to conform to the shape of the
20 tool handle.

At least one said blister pack may be perforated between at least one pair of adjacent chambers.

- 25 This provides the advantage of facilitating folding of the blister pack.

At least one said blister pack may further comprise locating means for enabling the blister pack to be mounted to a support.

- 30 Said locating means may comprise at least one aperture through said blister pack at a respective location remote from the or each said chamber.

The assembly may further comprise support means adapted to be located on a side of at least one said blister pack remote from the corresponding said engaging portion.

- 5 The assembly may further comprise at least one cover plate for location over the or each said flexible member in position on the surface of the handle.

At least one said cover plate may comprise a respective substantially rigid member having at least one respective aperture for enabling at least part of said engaging
10 portion to protrude therethrough.

At least one said blister pack may be adapted to be located between at least one said cover plate and a said support means.

- 15 At least one said chamber containing the or each said gel material may be at least partially transparent in use.

This provides the advantage of enabling visible indicia, such as decorative features or trade marks, or electrical indicators, for example indicating that the tool of which the
20 assembly forms part is actuated, to be seen while the tool is in use.

The assembly may further comprise at least one visible indicium located in at least one said chamber.

- 25 At least one said visible indicium may be electrically operated in use.

This provides the advantage of enabling said indicium to provide an indication of an operating condition of a power tool, such as whether the tool is actuated.

- 30 At least one said indicium may be at least one light emitting diode.

The assembly may further comprise at least one electrical switch for actuating the tool.

This provides the advantage of simplifying assembly of the tool, which in turn further
5 reduces the cost of manufacture of the tool.

According to another aspect of the present invention, there is provided a tool comprising:

- 10 a housing;
- a motor within the housing adapted to actuate an output member of the tool;
- and
- a handle assembly as defined above.

- 15 Said engaging portion may have an outer surface including at least one material of higher coefficient of friction than the material of the housing of the tool.

Preferred embodiments of the invention will now be described, by way of example only and not in any limitative sense, with reference to the accompanying drawings, in
20 which:-

Figure 1 is a perspective view of part of a housing of a power tool of a first embodiment of the present invention;

- 25 Figure 2 is an exploded perspective view of the partial housing of the embodiment of Figure 1;

Figures 3A to 3C show side cross-sectional views of three alternative forms of gel blister pack for use in the embodiment of Figures 1 and 2;

30

Figure 4A is an exploded view of a handle assembly of a power tool of a second embodiment of the present invention;

Figure 4B is a view of the handle assembly of Figure 4A in an assembled condition;

5

Figure 4C is a perspective view from below of the gel blister pack of Figure 4A;

Figure 5A is an exploded view, corresponding to Figure 4A, of a handle assembly of a power tool of a third embodiment of the present invention;

10

Figure 5B is a view of the handle assembly of Figure 5A in an assembled condition;

Figure 6A is an exploded view, corresponding to Figure 4A, of a handle assembly of a power tool of a fourth embodiment of the present invention;

15

Figure 6B is a perspective view of the blister pack of Figure 6A in an unfolded condition thereof; and

Figure 7 is an exploded view, corresponding to Figure 4A, of a handle assembly of a power tool of a fifth embodiment of the present invention.

20

Referring to Figures 1 and 2, a power tool 1 such as a drill or jigsaw comprises a housing 2 defining an aperture 3 bounded on one side thereof by a handle 4, the housing 2 containing a motor (not shown) for actuating an output member such as a drill bit or jigsaw blade (not shown).

25

The housing 1 is formed from a generally durable plastics material, as will be familiar to persons skilled in the art, and has a recessed portion 5 on a generally smooth upper surface of the handle 4, the recessed portion 5 being provided with a recess 6 containing an actuating switch (not shown) for turning the tool 1 on and off. The

30

housing 2 is provided with ventilation apertures 7 at one end of the recessed portion 5 to allow cooling of the interior of the housing 2.

5 A flexible sheet 8, of thermoplastic elastomeric material, such as a thin layer of polyurethane, having a coefficient of friction higher than that of the material from which the housing 2 is made, is formed by means of a suitable method such as moulding. The sheet 8 has a periphery shaped to fit inside the periphery of recessed portion 5 to cover all of the recessed portion 5 except that part in which the ventilation apertures 7 are provided, and the flexible sheet 8 is provided with a through-aperture 9
10 to allow access to the actuating switch in recess 6. The flexible sheet 8 is also provided with a series of protrusions 10, each of which defines a chamber between the sheet 8 and the upper surface of the handle 4 of the housing 2 when the sheet 8 is placed in position on the upper surface of the recessed portion 5. Each of the chambers underneath the protrusions 10 accommodates a vibration damping gel
15 contained in a blister pack 20 (Figures 3A to 3C). Alternatively, the flexible sheet 8 may be bonded to a backing sheet (not shown) to define the chambers containing the vibration damping gel.

A cover plate 11 of durable plastics material, such as the material from which the housing 2 is constructed, has an internal surface 12 corresponding generally to the
20 external (i.e. upper) surface of the flexible sheet 8. The cover plate 11 is provided with a series of first apertures 13 for allowing the protrusions 10 of the sheet 8 to protrude therethrough when the plate 11 is mounted to the handle 4 to secure the flexible sheet 8 in place, a second aperture 14 co-operating with the aperture 9 to allow access to the
25 actuating switch in recess 6, and a series of third apertures 15 cooperating with the ventilation apertures 7 in the housing 2.

Referring now to Figure 3A, a gel blister pack 20 for use in the embodiment of Figures 1 and 2 is formed from a thin, flexible backing piece 21 of thermoplastic
30 polyurethane film on which one or more pieces 22 of a vibration damping gel formed from a semi-solid silicone rubber or polyurethane material are provided. The pieces 22

of gel may be translucent and/or semi transparent and/or coloured, for reasons which will be explained in greater detail below. The backing layer 21 with the pieces 22 of gel are then covered by a generally transparent layer 23 of thin, thermoplastic polyurethane film, which is pulled down tightly over the gel pieces 22 by means of a
5 combination of heat and pressure, and then secured to the backing piece 21 at the periphery 24 of each gel piece 22 by suitable welding techniques, such as heat staking or ultrasonic vibration or radio frequency, which will be familiar to persons skilled in the art. Alternatively, the gel material 22 can be poured or injected into a pre-formed transparent sheet 23 and then covered by backing piece 21 and welded. The upper
10 surface of the backing piece 21 may be printed with decorative or trade mark information which is visible through the transparent layer 23 and gel 22.

Referring to Figure 3B, in which parts common to the embodiment of Figure 3A are denoted by like reference numerals but increased by 100 and will therefore not be
15 described in greater detail herein, the backing piece 121 of the blister pack 120 is provided with a series of raised portions 125 which may be decorative matter and/or trade marks or raised lettering. The raised portions 125 define recesses 126, which may accommodate light emitting diodes which can be illuminated to provide a visual indication of an operating parameter of the tool incorporating the blister pack 120, for
20 example to indicate whether the tool is switched on.

In the arrangement of Figure 3C, in which parts common to the embodiment of Figure 3B are denoted by like reference numerals but increased by 100, the raised portions 225 defining recesses 226 may be formed by a separate layer 227, which is
25 encapsulated along with gel material 222 by transparent sheet 223 and backing piece 221.

The operation of the handle 4 of the tool 1 of Figures 1 to 3 will now be described.

30 When a user's hand (not shown) grips the tool 1 when in use, the user's hand comes into contact with the cover plate 11 and the protrusions 10 beneath which one or more

blister packs 20, 120, 220 containing vibration damping gel are located. As a result, vibrations generated by the motor in the tool housing 2 are damped by the vibration damping gel underneath protrusions 10, and the user's grip on the tool is maintained by contact between the user's hand and the high friction material of the flexible sheet

- 5 8. It can therefore be seen that by suitable choice of material of the flexible sheet 8, the frictional properties of the sheet 8 can be optimised, while the vibration damping properties of the gel-filled blister packs 20, 120, 220 are generally superior to the vibration damping properties of known high friction materials or air filled cushions used in conventional handle assemblies.

10

- Referring to Figures 4A to 4C, in which parts common to the embodiment of Figures 1 and 2 are denoted by like reference numerals but increased by 300, a handle 404 of a power tool 401 of a second embodiment of the invention, for example a sander, is defined by two halves 402A, 402B of housing 402 around ON/OFF switch 429. The
- 15 housing 402 defines an aperture 428 which enables the transparent layer 23 of the blister pack 20 of Figure 3A to protrude therethrough, and the blister pack 20 is mounted to a cover plate 411 of hard plastics material by means of pegs 432 provided on cover plate 411 which are located in corresponding apertures 34 on blister pack 20 externally of gel material 22 and then deformed or heat staked to provide flattened
- 20 portions 433 (Figure 4C) to prevent removal of the blister pack 20 from cover plate 411. The apertures 34 may be reinforced by welding together the adjacent parts of the backing piece 21 and transparent layer 23. The cover plate 411 is then located in position relative to the housing 402 by locating an edge 430 of the cover plate 411 in a slot 431 in housing part 402A, and the opposite edge in a corresponding slot (not
- 25 shown) in housing part 402B.

- Referring now to Figures 5A and 5B, in which parts common to the embodiment of Figures 4A to 4C are denoted by like reference numerals but increased by 100, a handle assembly 504 of a third embodiment of the invention is provided with a
- 30 support or carrier 540 of moulded hard plastics material having pegs 541 which are located in corresponding apertures 34 of blister pack 20 to mount the blister pack 20

to the carrier 540. The pegs 541 of carrier 540 interconnect with circular bosses (not shown) of cover plate 511 to locate the blister pack 20 between the carrier 540 and cover plate 511 with the transparent sheet 23 covering gel material 22 protruding through apertures 513 in cover plate 511.

5

A handle assembly 604 of a fourth embodiment of the invention is shown in Figure 6A, in which parts common to the embodiment of Figures 5A and 5B are denoted by like reference numerals but increased by 100. The blister pack 20 is provided with perforations 50 along lines 51 to enable the blister pack 20 to be folded along lines 51.

10 This enables the blister pack 20 to be mounted to carrier 640 of generally inverted right-angled U-shape and secured to the carrier 640 by location of pegs 641 through apertures 34. The pegs 641 can also interconnect with cylindrical bosses 642 in the housing 604 to secure the support 640 in position in the housing. In this way, the gel material 22 of the blister pack 20 can provide vibration damping in more than one
15 plane.

Referring now to Figure 7, in which parts common to the embodiment of Figure 6A are denoted by like reference numerals but increased by 100, a handle assembly 704 of a fifth embodiment of the invention is provided with a pair of vibration damping
20 blister packs 20 mounted to respective supports 740, 740A. The carrier 740A is also provided with an ON/OFF switch 729 for actuating the tool and which can be connected to the power supply (not shown) of the tool by means of electrical leads 760. This enables the carrier 740A together with the switch 729 to be mounted to the housing 704 as a complete module or assembly, which simplifies assembly of the tool
25 and therefore reduces the cost of manufacturing the tool.

It will be appreciated skilled in the art that the above embodiments have been described by way of example only, and not in any limitative sense, and that various alterations and modifications are possible without departure from the scope of the
30 invention as defined by the appended claims.

CLAIMS

1. A handle assembly for a power tool comprising a housing defining a handle and housing a motor for actuating an output member of the tool, the assembly comprising
- 5 at least one flexible member adapted to be mounted to a surface of the handle of the power tool and having an engaging portion adapted to be engaged by a hand of a user of the tool, and at least one chamber containing at least one vibration damping gel material located in use between the engaging portion and the surface of the handle.
- 10 2. An assembly according to claim 1, wherein at least one said chamber is formed in a respective blister pack.
3. An assembly according to claim 2, wherein at least one said blister pack includes at least one said flexible member.
- 15 4. An assembly according to claim 2 or 3, wherein at least one said blister pack comprises respective first and second flexible sheets defining at least one said chamber therebetween, wherein said first and second sheets of the or each said blister pack are sealed to each other at the periphery of the or each said chamber.
- 20 5. An assembly according to any one of claims 2 to 4, wherein at least one said blister pack is foldable.
6. An assembly according to claim 5, wherein at least one said blister pack is
- 25 perforated between at least one pair of adjacent chambers.
7. An assembly according to any one of claims 2 to 6, wherein at least one said blister pack further comprises locating means for enabling the blister pack to be mounted to a support.

30

8. An assembly according to claim 7, wherein said locating means comprises at least one aperture through said blister pack at a respective location remote from the or each said chamber.

5 9. An assembly according to any one of claims 2 to 8, further comprising support means adapted to be located on a side of at least one said blister pack remote from the corresponding said engaging portion.

10 10. An assembly according to any one of the preceding claims, further comprising at least one cover plate for location over the or each said flexible member in position on the surface of the handle.

15 11. An assembly according to claim 10, wherein at least one said cover plate comprises a respective substantially rigid member having at least one respective aperture for enabling at least part of said engaging portion to protrude therethrough.

12. An assembly according to claim 9 and 10 or 11, wherein at least one said blister pack is adapted to be located between at least one said cover plate and a said support means.

20 13. An assembly according to any one of the preceding claims, wherein at least one said chamber containing the or each said gel material is at least partially transparent in use.

25 14. An assembly according to any one of the preceding claims, further comprising at least one visible indicium located in at least one said chamber.

15. An assembly according to claim 14, wherein at least one said visible indicium is electrically operated in use.

30

13

16. An assembly according to claim 15, wherein at least one said indicium is at least one light emitting diode.

17. An assembly according to any one of the preceding claims, further comprising at least one electrical switch for actuating the tool.

18. A handle assembly for a power tool comprising a housing defining a handle and housing a motor for actuating an output member of the tool, the assembly substantially as hereinbefore described with reference to the accompanying drawings.

10

19. A tool comprising:

a housing;

a motor within the housing adapted to actuate an output member of the tool;

and

15 a handle assembly according to any one of the preceding claims.

20. A tool according to claim 19, wherein said engaging portion has an outer surface including at least one material of higher coefficient of friction than the material of the housing of the tool.

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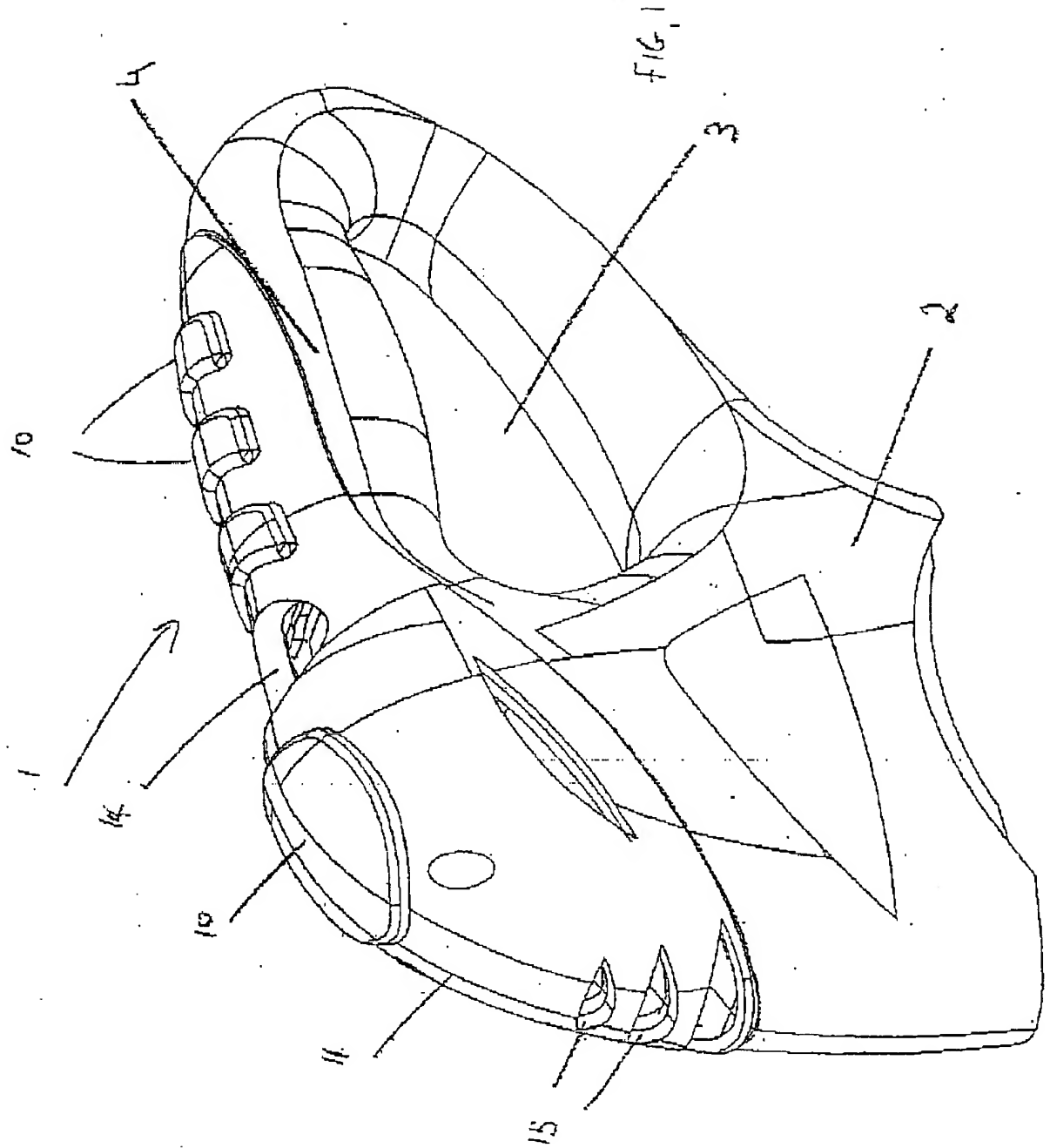
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ABSTRACT**HANDLE ASSEMBLY FOR TOOL**

5 A handle assembly for a power tool 1 comprises a housing 2 defining a handle 4 and housing a motor for actuating an output member of the tool, such as a drill bit or jigsaw blade. The handle assembly comprises at least one flexible sheet 8 adapted to be mounted to a surface of the handle of the power tool and having a series of
10 protrusions 10 adapted to be engaged by a hand of a user of the tool. The protrusions 10 retain one or more blister packs (not shown) containing at least one vibration damping gel material between the flexible sheet 8 and the surface of the handle 4.

[Figure 2]

15

$\frac{1}{2}$ 



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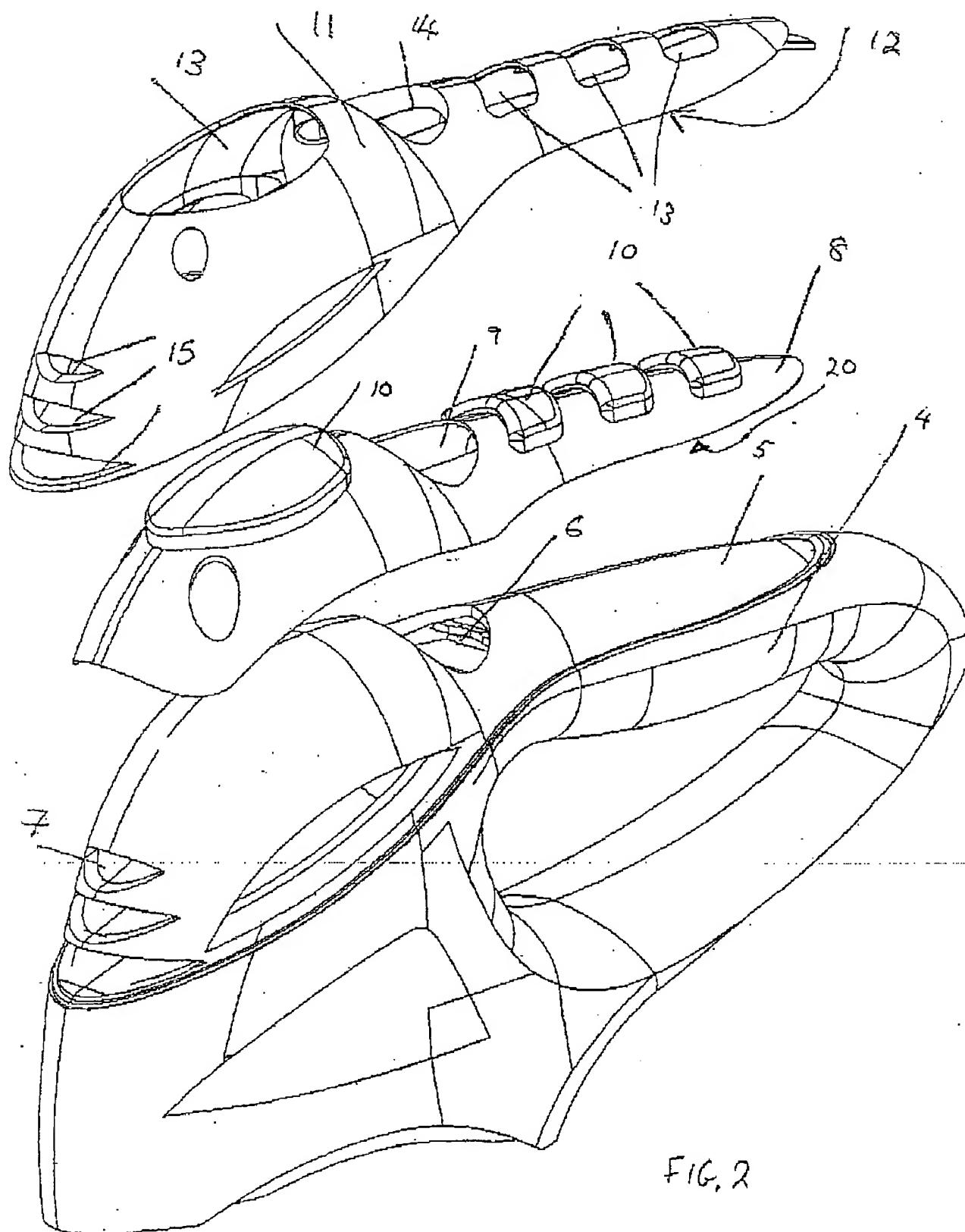


FIG. 2



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FIG. 3A

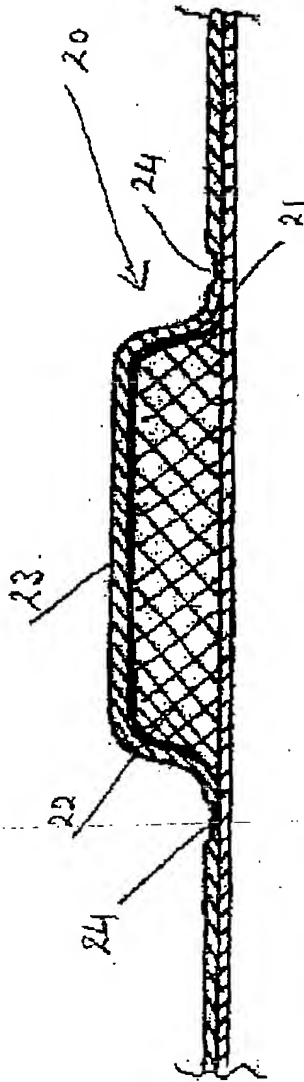


FIG 3B

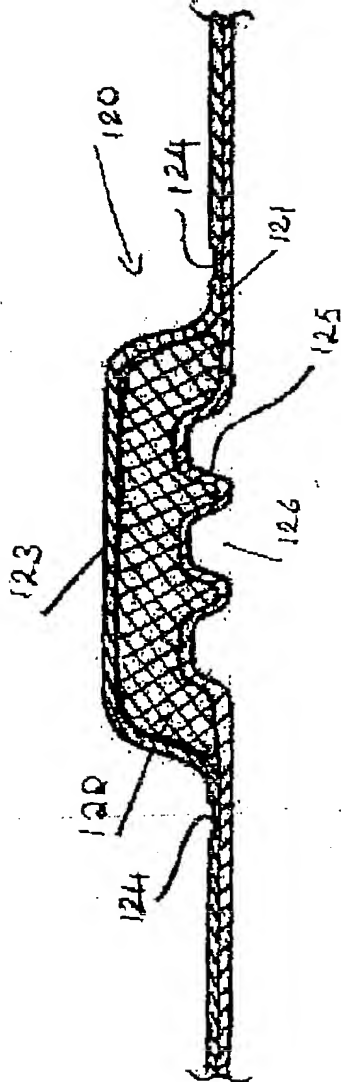
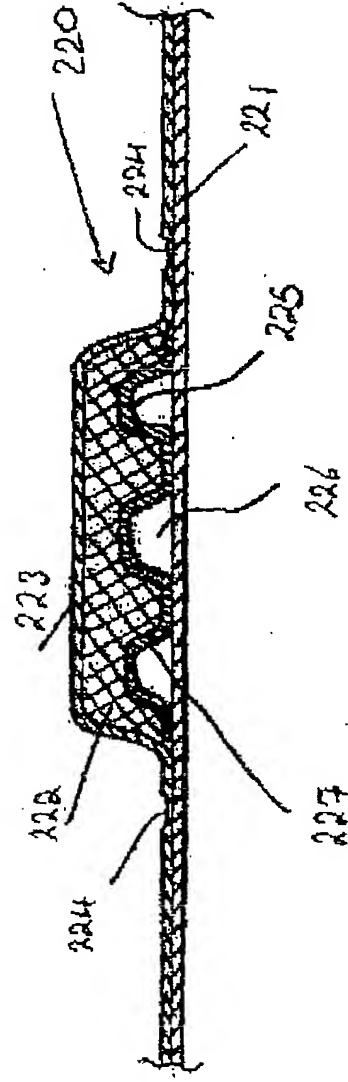


FIG 3C



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FIG. 4A

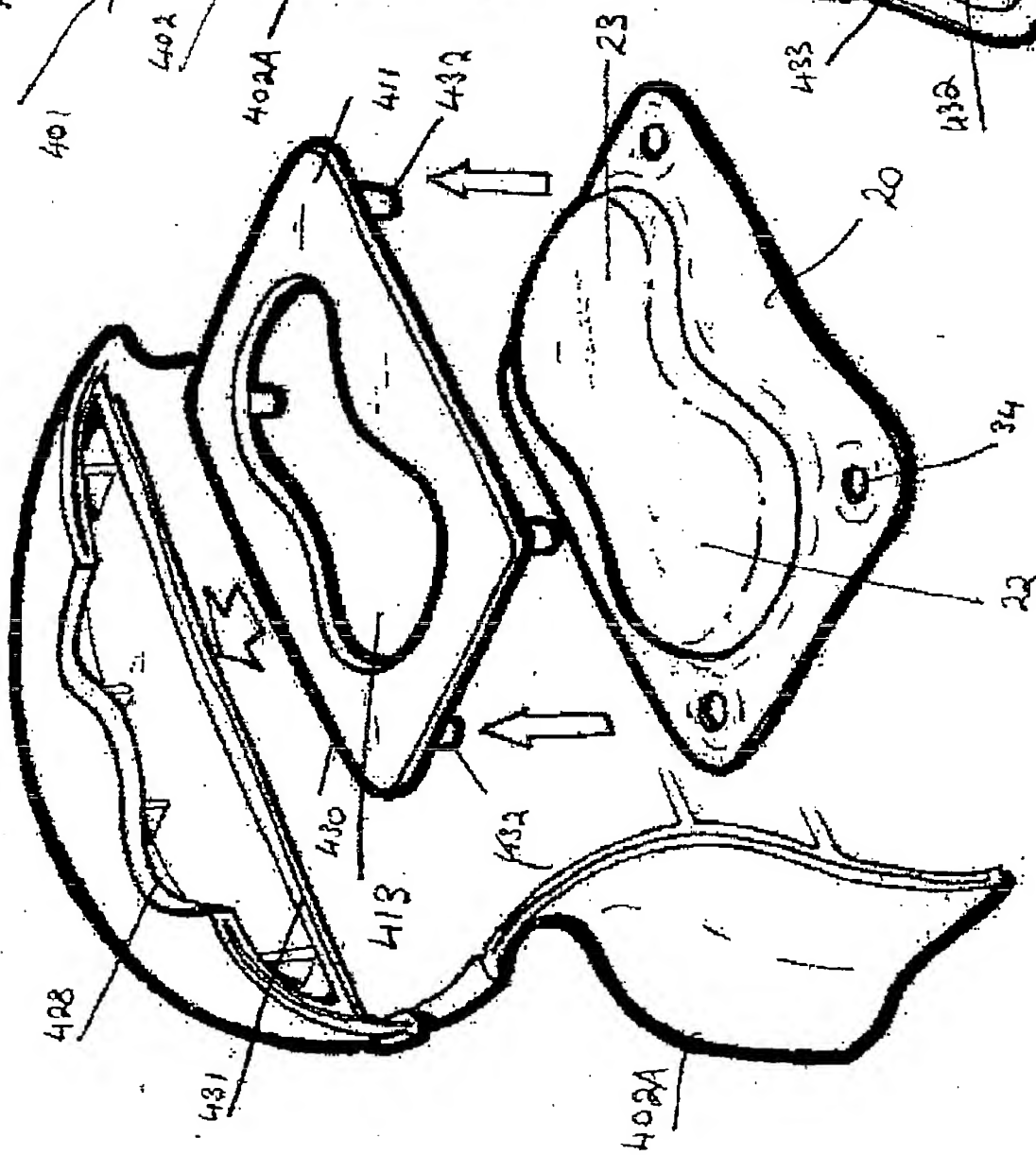


FIG. 4B

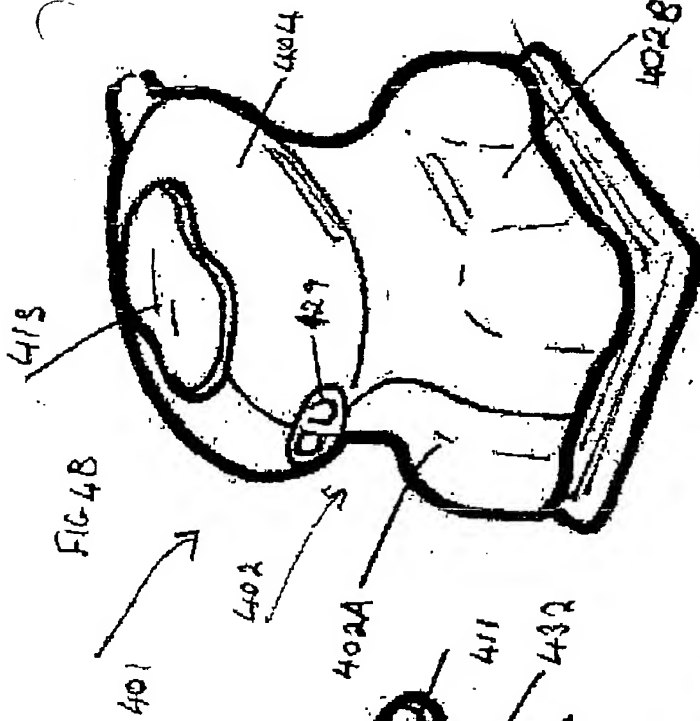
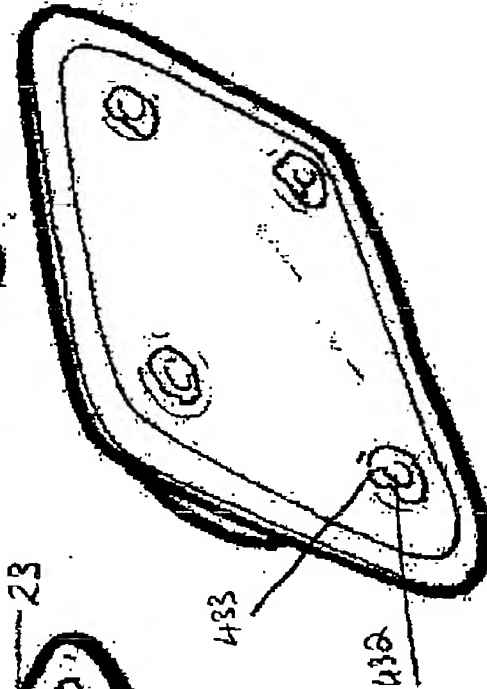
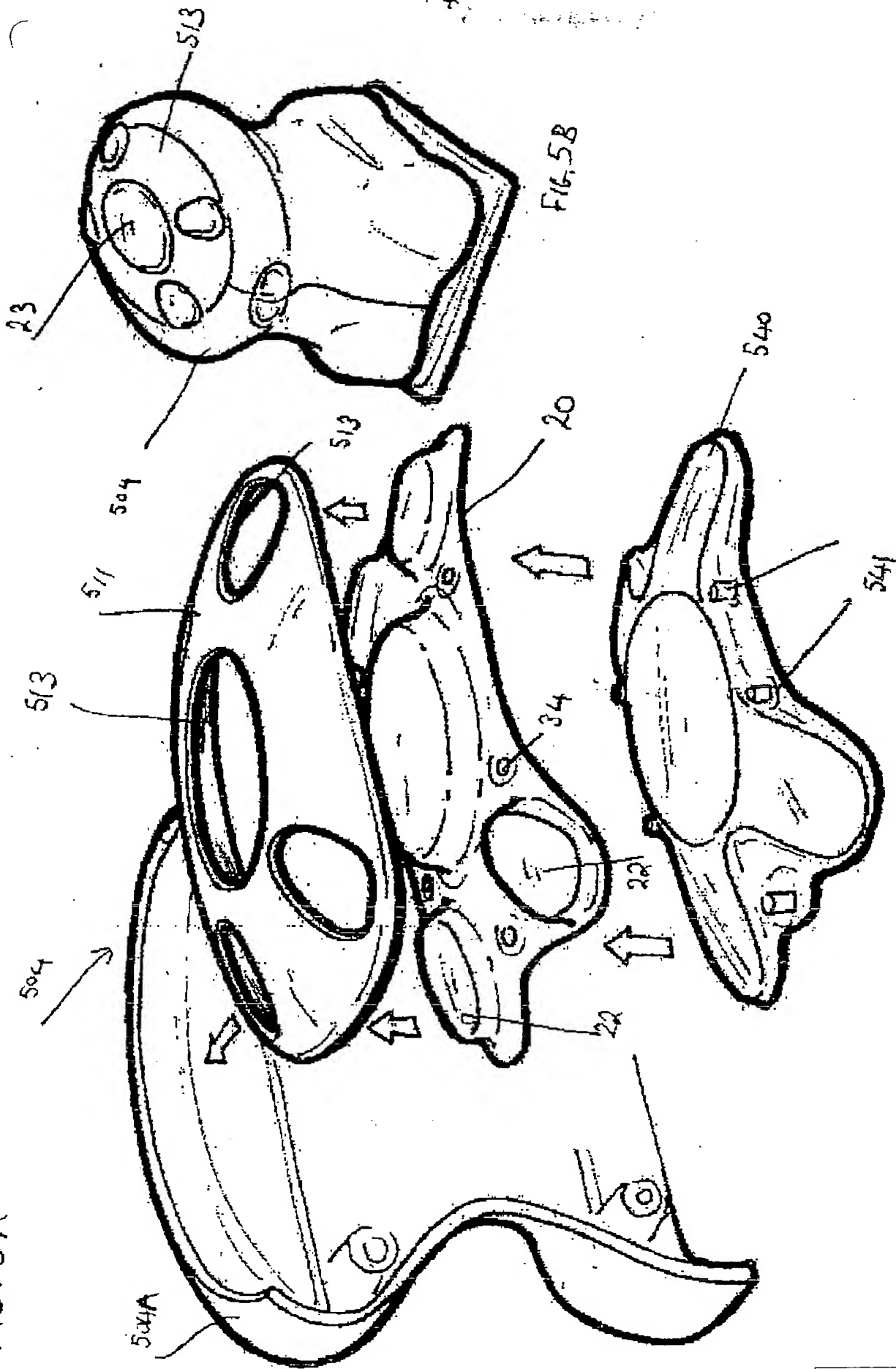


FIG. 4C

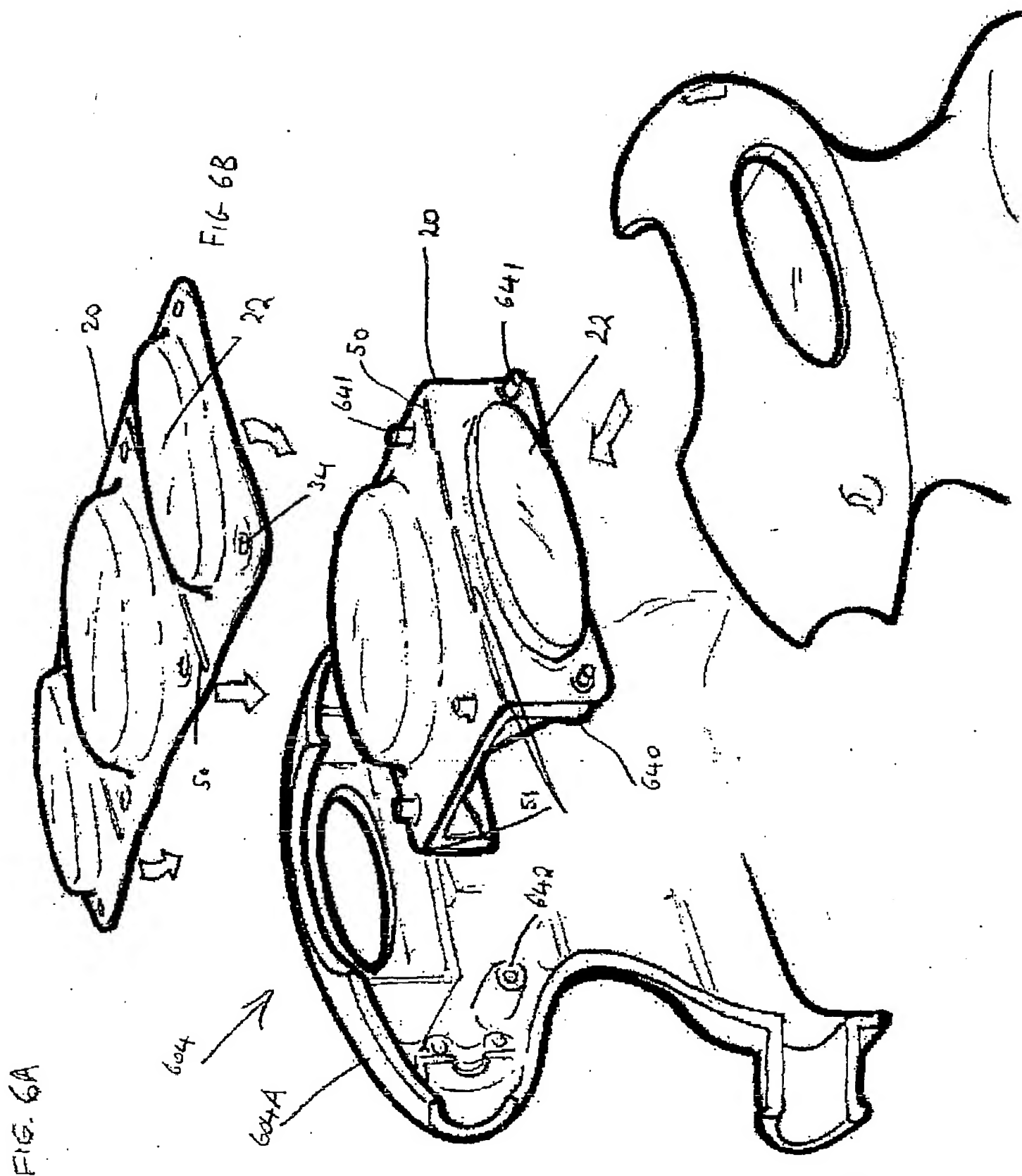


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FIG. 5A



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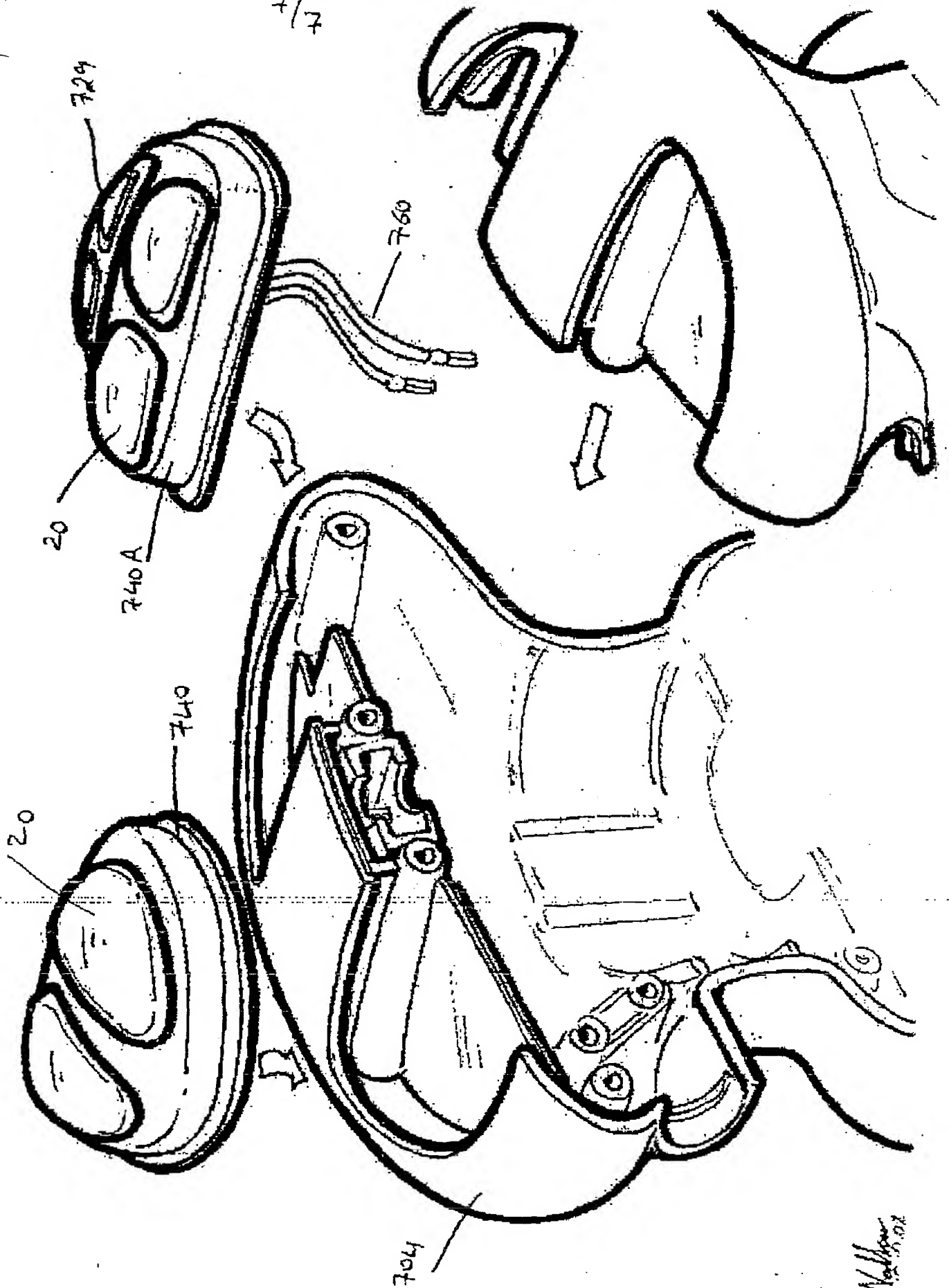


FIG. 7

